LABORATORIES

WHAT happens to wireless waves between transmitter and receiver? That is the quest which is always the object of the Propagation Section at Baddow Research.

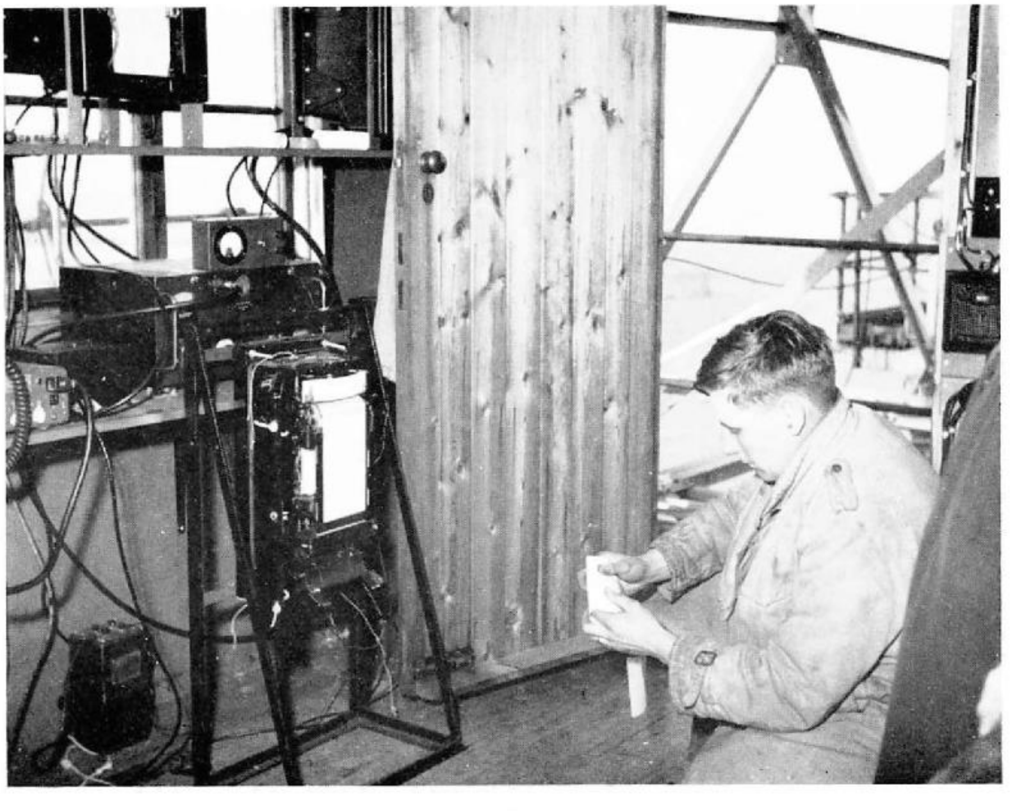
The answers can only be found by constant calculation and test. They lay the foundations of the knowledge which is needed to maintain the working quality of equipment which goes out from the shops, on contracts at home and abroad.

Our problems are governed by the lengths of waves, as the sort of thing which happens to waves depends very much on their length. For example, short waves about thirty metres long are reflected from the ionosphere, away up, making transatlantic and long-distance transmissions possible.

BY G. C. RIDER,
PROPAGATION SECTION

We are working with shorter waves, 3 cm. and 8 mm. long, and it is not surprising that they behave very differently. Their behaviour is similar to light waves, and our aerial arrays might almost appear reminiscent of the optical experiments so often repeated in the school physics lab.

Working in the hut laboratory on a mast platform two hundred feet up at Great Bromley, G. C. Rider changes the strip on a recorder receiving experimental signals from Danbury



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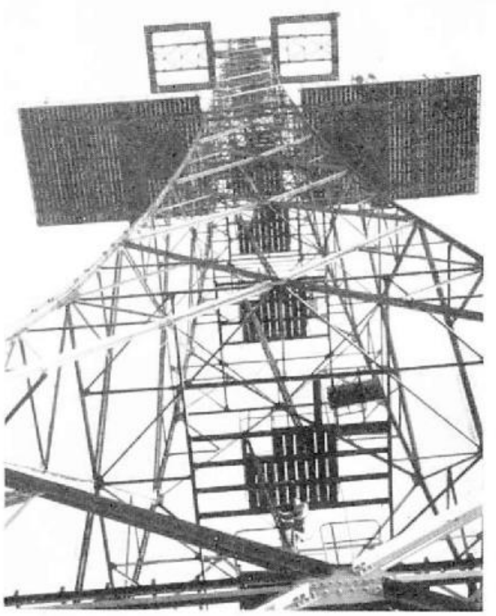
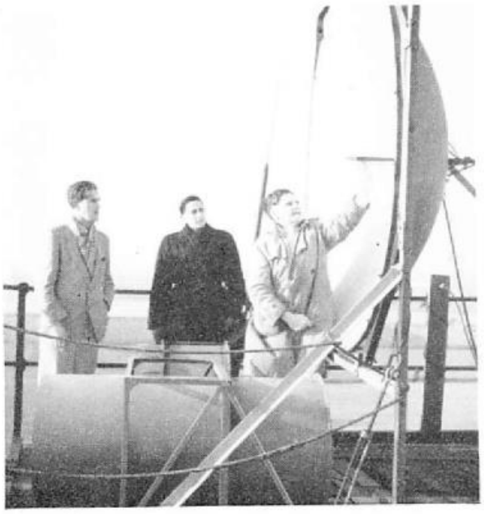


Microwaves, these extremely short waves, are used to carry TV signals from point to point on their journey from outside broadcast camera to TV transmitter. They can also be used to carry a phenomenal number of telephone channels, and for other purposes. So it is important that we should know their exact limitations and possibilities.

Our tests run between Great Bromley on the Colchester–Harwich road and Point Clear, St. Osyth, on the coast at the head of the Brightlingsea Reach. At Bromley we gain height on the disused radar tower, one of three masts built with foresight, which stood as sentinels

Lining up an aerial. S. J. Masters, left, is assisting G. C. Rider in the experiments. Looking up the mast, above, John Holloway is at the rail of the right platform



The X Band aerial on the mast. Examining the wave guide are, left to right, S. J. Masters, J. Holloway and G. C. Rider. In the rainhood, in the foreground, is the Q Band aerial. There is another at the top of the mast 360 feet up

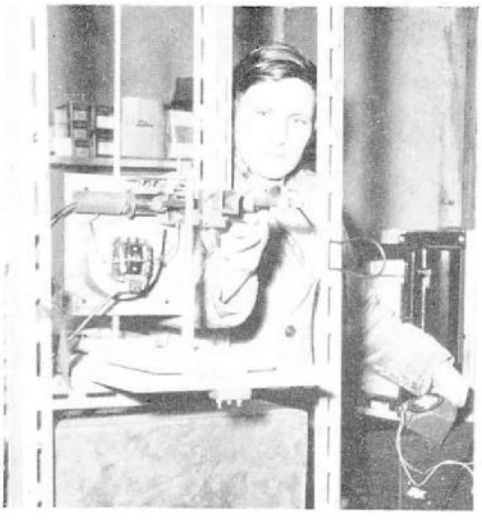
to warn us of Hitler's clutching hand, and to direct the fighters in their thrusts which cast him off. At "Toosey", which is Essex for St. Osyth, we surmount the Martello tower overlooking the sea on the Point Clear road. This is a robust brick tower with a moatlike hazard round its base twenty feet deep. On its battlements, gunners stood with powder and shot, ready to tear Napoleon's ships to pieces if they ever reached our shores.

On this roof, next the little chimney which smoked in Wellington's time, stands our wooden hut. Here the transmitter is inside the aerial—is this unique? The end wall of our hut is recessed to form a rain shield, and the four-foot diameter lens aerial is inside, the feed horn set back from it by the focal distance of the lens, so that the whole hut may not unfairly be described as "the aerial" and shelters all our gear, beside any stray engineers sheltering from the elements.

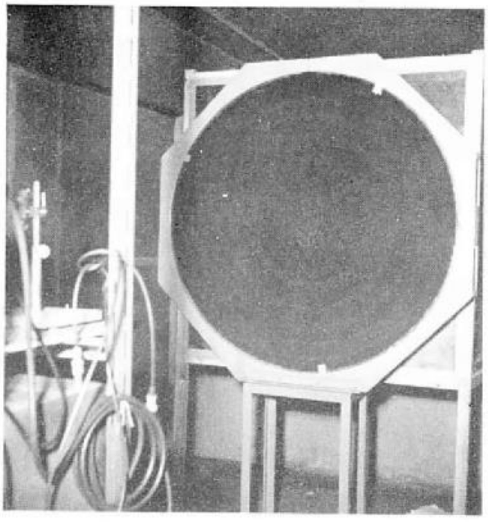
These stations are used to some extent because they are already there, but chiefly because they are suitable for this kind of work. Great Bromley mast is 360 feet high, and we are using every inch of it, not merely the top. The receiving aerials, looking like short torpedo tubes because of their rain hoods, are placed at three different heights giving us verti-

It is necessary for the experiments to have meteorological data. Here is Len Peck, the most agile mast climber of the party, adjusting the sunshine recorder

Signals decrease in strength in heavy rain. For accurate comparison, regular readings of rainfall must be taken. G. C. Rider checking a tilting siphon rain recorder



The transmitter of the Q Band signal from St. Osyth to Great Bromley. Waves are generated by the Klystron valve and emitted from the horn, centre. Wave strength is recorded



The waves diverging from the horn are redirected as a parallel beam by the tubular lens. This aerial hut, with rainhood recessed, is mounted on a Martello tower

cal diversity. Quite small-scale changes in the weather may deflect or absorb our beam, and the biggest problem is to find out just which meteorological changes affect the signal, why they affect it and by how much.

Rain is the most obvious weather element; we measure its rate of fall at three different places, and compare the average rate with the measured signal strength. Raindrops are comparable in size with our shorter, 8 mm., wavelength; that is why a good storm knocks a hole in the signal.

Temperature and humidity are measured at six levels up the Bromley mast, using wet and dry bulb electrical resistance thermometers; and as distilled water is required at all these levels, there is good climbing for Len Peck. Visiting the laboratory hut on the mast is our exercise, for we climb two hundred ladder rungs to the platform on which it sits behind the aerials. Here the receivers and recorders are very safe from prying eyes and fingers. There have been days when we couldn't see the ground, but we have never lost our way on the mast!

The rest of our weather station is at ground level. The cup anemometer for measuring wind speeds, and the rain gauge have been working hard lately; and there is a sunshine recorder of the fortune-teller's crystal variety. The glass ball burns a trace on a card—if the sun is shining.

The tests have gone on for about a year now, so we have sampled all kinds of weather, and tested our radio gear and our stations thoroughly. Our transmitters and receivers, although not our chief interest, are mostly our own handiwork. D. J. Brockington has designed the bulk of the radio gear, and J. Holloway has made most of it.

We have bagged a good collection of signal fluctuations so far. Good for us, that is, for one man's meat is another man's poison and most people like to see a rock-steady signal record. We "know the answers" to a good proportion of these fluctuations, but there is still much to find out. Every detail must be noted, for what now seems insignificant may turn out to be of great importance in future applications of these wavelengths.